

Serial No. 10/623,856  
March 31, 2005  
Reply to the Office Action dated December 7, 2004  
Page 2 of 14

**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**LISTING OF CLAIMS:**

Claim 1 (currently amended): A piezoelectric filter comprising:

a plurality of piezoelectric resonators including a substrate and a vibration portion provided on the substrate, the vibration portion having a structure in which top and bottom surfaces of a thin film portion including at least one piezoelectric thin film are sandwiched between at least a pair of an upper electrode and a lower electrode facing each other, and wherein

~~the upper electrode of at least one of the plurality of piezoelectric resonators is made of a material having susceptibility to etching that is different from that of the upper electrodes of the other piezoelectric resonators~~

an additional film provided on the upper electrode of at least one of the plurality of piezoelectric resonators; wherein

the additional film has susceptibility to physical etching that is lower than that of materials used for the upper electrodes of the others of the plurality of piezoelectric resonators.

Claim 2 (canceled).

Claim 3 (currently amended): The piezoelectric filter according to Claim ~~2~~1, wherein the upper electrodes of the plurality of piezoelectric resonators are made of the same material.

Claim 4 (currently amended): A piezoelectric filter comprising:

Serial No. 10/623,856  
March 31, 2005  
Reply to the Office Action dated December 7, 2004  
Page 3 of 14

a plurality of piezoelectric resonators including a substrate and a vibration portion provided on the substrate, the vibration portion having a structure in which top and bottom surfaces of a thin film portion including at least one piezoelectric thin film are sandwiched between at least a pair of an upper electrode and a lower electrode facing each other; wherein

the vibration portions of the plurality of piezoelectric resonators are covered with a protective film, and an additional electrode is provided on the upper electrode of at least one of the plurality of piezoelectric resonators with the protective film being located therebetween; and

the protective film has susceptibility to physical etching that is lower than that of the additional electrode.

Claim 5 (original): The piezoelectric filter according to Claim 1, wherein the piezoelectric thin film includes one of ZnO and AlN.

Claim 6 (original): The piezoelectric filter according to Claim 1, wherein the substrate has at least one of an opening and a concave portion, and the vibration portion is provided on the at least one of the opening and the concave portion.

Claim 7 (original): A piezoelectric filter comprising:

a plurality of piezoelectric resonators including a piezoelectric substrate and a vibration portion having a structure in which the piezoelectric substrate is sandwiched between at least a pair of an upper electrode and a lower electrode facing each other; wherein

the upper electrode of at least one of the plurality of piezoelectric resonators is made of a material having susceptibility to etching that is different from that of the upper electrodes of the other piezoelectric resonators.

Serial No. 10/623,856  
March 31, 2005  
Reply to the Office Action dated December 7, 2004  
Page 4 of 14

Claim 8 (original): A piezoelectric filter comprising:

a plurality of piezoelectric resonators including a piezoelectric substrate and a vibration portion having a structure in which the piezoelectric substrate is sandwiched between at least a pair of an upper electrode and a lower electrode facing each other; wherein

an additional film is provided on the upper electrode of at least one of the plurality of piezoelectric resonators, and the additional film has susceptibility to etching that is different from that of the material for the upper electrode.

Claim 9 (original): The piezoelectric filter according to Claim 7, wherein the vibration portions of the plurality of piezoelectric resonators are covered with a protective film, and an additional electrode is provided on the upper electrode of at least one of the plurality of piezoelectric resonators with the protective film being located therebetween.

Claim 10 (original): The piezoelectric filter according to Claim 7, wherein the lower electrode of at least one of the plurality of piezoelectric resonators is made of a material having susceptibility to etching that is different from that of the lower electrodes of the other piezoelectric resonators.

Claim 11 (original): The piezoelectric filter according to Claim 7, wherein an additional film is provided on the lower electrode of at least one of the plurality of piezoelectric resonators, and the additional film has susceptibility to etching that is different from that of the materials for the lower electrodes of the other piezoelectric resonators.

Claim 12 (original): The piezoelectric filter according to Claim 7, wherein at least a portion of the plurality of piezoelectric resonators share a lower electrode.

Serial No. 10/623,856  
March 31, 2005  
Reply to the Office Action dated December 7, 2004  
Page 5 of 14

Claim 13 (original): The piezoelectric filter according to Claim 1, wherein the plurality of piezoelectric resonators are arranged in a ladder configuration.

Claim 14 (original): A duplexer comprising the piezoelectric filter according to Claim 1.

Claim 15 (currently amended): A composite piezoelectric resonator comprising:  
a plurality of piezoelectric resonators including a substrate and a vibration portion provided on the substrate, the vibration portion having a structure in which top and bottom surfaces of a thin film portion including at least one piezoelectric thin film are sandwiched between at least a pair of an upper electrode and a lower electrode facing each other; and wherein

~~wherein the upper electrode of at least one of the plurality of piezoelectric resonators is made of a material having susceptibility to etching that is different from that of the upper electrodes of the other piezoelectric resonators~~

an additional film provided on the upper electrode of at least one of the plurality of piezoelectric resonators; wherein

the additional film has susceptibility to physical etching that is lower than that of materials used for the upper electrodes of the others of the plurality of piezoelectric resonators.

Claims 16 and 17 (canceled).

Claim 18 (original): The composite piezoelectric resonator according to Claim 15, wherein the piezoelectric thin film includes at least one of ZnO and AlN.

Serial No. 10/623,856

March 31, 2005

Reply to the Office Action dated December 7, 2004

Page 6 of 14

Claim 19 (original): The composite piezoelectric resonator according to Claim 15, wherein the substrate has at least one of an opening and a concave portion, and the vibration portion is provided on the at least one of the opening and the concave portion.

Claim 20 (original): A communication device comprising at least one of the piezoelectric filter according to Claim 1, the duplexer according to Claim 14, and the composite piezoelectric resonator according to Claim 15.

Claim 21 (currently amended): A method for adjusting the frequency of a piezoelectric filter comprising the steps of:

providing a piezoelectric filter including a plurality of piezoelectric resonators including a substrate and a vibration portion provided on the substrate, the vibration portion having a structure in which top and bottom surfaces of a thin film portion including at least one piezoelectric thin film are sandwiched between at least a pair of an upper electrode and a lower electrode facing each other and an additional film is provided on the upper electrode of at least one of the plurality of piezoelectric resonators, and the additional film has susceptibility to physical etching that is lower than that of materials used for the upper electrodes of the others of the plurality of piezoelectric resonators ~~the upper electrode of at least one of the plurality of piezoelectric resonators is made of a material having susceptibility to etching that is different from that of the upper electrodes of the other piezoelectric resonators;~~ and adjusting the frequency of the at least one of the plurality of piezoelectric resonators by etching the upper electrode of the at least one of the plurality of piezoelectric resonators.

Claim 22 (canceled).

Serial No. 10/623,856

March 31, 2005

Reply to the Office Action dated December 7, 2004

Page 7 of 14

Claim 23 (currently amended): A method for adjusting the frequency of a piezoelectric filter comprising the steps of:

providing a piezoelectric filter including a plurality of piezoelectric resonators including a substrate and a vibration portion provided on the substrate, the vibration portion having a structure in which top and bottom surfaces of a thin film portion including at least one piezoelectric thin film are sandwiched between at least a pair of an upper electrode and a lower electrode facing each other, the vibration portions of the plurality of piezoelectric resonators are covered with a protective film, and an additional electrode provided on the upper electrode of at least one of the plurality of piezoelectric resonators with the protective film being located therebetween, wherein the protective film has susceptibility to physical etching that is lower than that of the additional electrode; and

adjusting the frequency of the at least one of the plurality of piezoelectric resonators by etching the additional electrode.

Claim 24 (original): The method for adjusting the frequency of a piezoelectric filter according to Claim 21, further comprising the step of adjusting the frequency of the plurality of piezoelectric resonators by adding a film to the vibration portion or by etching the vibration portion through an opening in the substrate arranged such that the vibration portion is provided on the opening.

Claim 25 (original): A method for adjusting the frequency of a piezoelectric filter comprising the steps of:

providing a piezoelectric filter including a plurality of piezoelectric resonators including a piezoelectric substrate and a vibration portion having a structure in which the piezoelectric substrate is sandwiched between at least a pair of an upper electrode and a lower electrode facing each other, the upper electrode of at least one of the plurality of



Serial No. 10/623,856

March 31, 2005

Reply to the Office Action dated December 7, 2004

Page 8 of 14

piezoelectric resonators is made of a material having susceptibility to etching that is different from that of the upper electrodes of the other piezoelectric resonators; and adjusting the frequency of the at least one of the plurality of piezoelectric resonators by etching the upper electrode of the at least one of the plurality of piezoelectric resonators.

Claim 26 (original): A method for adjusting the frequency of a piezoelectric filter comprising the steps of:

providing a piezoelectric filter including a plurality of piezoelectric resonators including a piezoelectric substrate and a vibration portion having a structure in which the piezoelectric substrate is sandwiched between at least a pair of an upper electrode and a lower electrode facing each other, an additional film provided on the upper electrode of at least one of the plurality of piezoelectric resonators, and the additional film has susceptibility to etching that is different from that of the material for the upper electrode; and

adjusting the frequency of the at least one of the plurality of piezoelectric resonators by etching the additional film.

Claim 27 (original): The method for adjusting the frequency of a piezoelectric filter according to Claim 25, further comprising the step of adjusting the frequency of the at least one of the plurality of piezoelectric resonators by etching a lower electrode of the at least one of the plurality of piezoelectric resonators, the lower electrode being made of a material having susceptibility to etching that is different from that of the lower electrodes of the other piezoelectric resonators.

Claim 28 (original): The method for adjusting the frequency of a piezoelectric filter according to Claim 25, further comprising the step of adjusting the frequency of the at least one of the plurality of piezoelectric resonators by etching an additional film of a

Serial No. 10/623,856

March 31, 2005

Reply to the Office Action dated December 7, 2004

Page 9 of 14

lower electrode after the frequency of the upper electrode is adjusted, the additional film is provided on the lower electrode of at least one of the plurality of piezoelectric resonators, and the additional film has susceptibility to etching that is different from that of the materials for the lower electrodes of the other piezoelectric resonators.

Claim 29 (original): The method for adjusting the frequency of a piezoelectric filter according to Claim 25, further comprising the step of adjusting the frequency of the at least one of the plurality of piezoelectric resonators by etching a lower electrode after the frequency of the upper electrode is adjusted, the lower electrode being shared among at least a portion of the plurality of piezoelectric resonators.

Claim 30 (new): The piezoelectric filter according to Claim 1, wherein the additional film is made of Al or  $\text{Al}_2\text{O}_3$ .

Claim 31 (new): The piezoelectric filter according to Claim 15, wherein the upper electrodes of the plurality of piezoelectric resonators are made of the same material.

Claim 32 (new): The piezoelectric filter according to Claim 15, wherein the additional film is made of Al or  $\text{Al}_2\text{O}_3$ .